

# CAD BASED AERATION SYSTEM MODELING SOFTWARE

## DESCRIPTION

### [Para 1] FIELD OF THE INVENTION

[Para 2] The invention is related to aeration system design software producing a plan view and section view CAD drawing and a materials take-off from a dialog box.

### [Para 3] BACKGROUND OF THE INVENTION

[Para 4] In the waste-water treatment industry it is necessary to provide drawings for technical process reasons and materials take-offs for providing accurate cost estimates. It is customary for the estimator to assign a draftsman for each quotation or active project order to draw the aeration system in a CAD program. The estimator reviews the drawing and determines the total quantity of each item required by the drawing.

[Para 5] One well known method of producing a drawing is computer-aided drafting within commercially available CAD software. Using this method, the draftsman must make judgments about quantity of headers pipes, quantity of support stands per header and spacing between header pipes and between header pipes and the tank walls. The draftsman must also properly locate the air drop pipe so that there is sufficient space between the drop pipe and the tank wall.

[Para 6] Computer-aided drafting within CAD is time consuming. It is especially so when evaluating and comparing different diffuser types as is common during the quotation stage of a project. It is common for a customer to request drawings of a system with 9" disc diffusers, an alternate system

with 12" disc diffusers, and a third option with tube diffusers. It is also common for a customer to request a variety of diffuser arrays within each diffuser category, to depict more energy-efficient and less energy-efficient systems. Generally speaking, the more diffusers there are in a tank, the more energy efficient the system will be.

[Para 7] An additional problem with the computer-aided CAD drafting method is the likelihood of human error.

#### [Para 8] SUMMARY OF THE INVENTION

[Para 9] The present invention provides an automated layout system that acquires data directly from a dialog box outside of the CAD environment. Aeration system drawings with a variety of diffuser types in thousands of arrangements can be effectively created automatically by linking a master database and rule set of selected requirements with a dialog box and CAD program. This method greatly accelerates the aeration system drawing and take-off procedures, and significantly reduces the chance for error.

#### [Para 10] BRIEF DESCRIPTION OF THE DRAWINGS

[Para 11] FIG. 1 is the program's login page.

[Para 12] FIG. 2a is the dialog box for Round Tanks into which data relevant to the drawing is entered by an operator (i.e. tank dimensions, diffuser type).

[Para 13] FIG. 2b is the dialog box for Square or Rectangular Tanks into which data relevant to the drawing is entered by an operator.

[Para 14] FIG. 3 is a plan view of a round tank with disc diffusers.

[Para 15] FIG. 4 is a section view of a disc diffuser.

[Para 16] FIG. 5 is a section view of a round tank with disc diffusers.

[Para 17] FIG. 6 is a table restating inputs from the operator into the dialog box.

[Para 18] FIG. 7 is a table showing the materials take-off as calculated by the program.

[Para 19] FIG. 8 is a plan view of a round tank with tube diffusers.

[Para 20] FIG. 9 is a section view of a round tank with tube diffusers.

[Para 21] FIG. 10 is a lateral view of a tube diffuser.

[Para 22] FIG. 11 is a plan view of a rectangular tank with disc diffusers.

[Para 23] FIG. 12 is a drawing of a support stand.

[Para 24] FIG. 13 is a drawing of an expansion joint.

[Para 25] FIG. 14 is a flow diagram showing the programming method.

[Para 26] FIG. 15 is a flow diagram showing the method employed by the operator to produce the drawing and materials take-off.

## [Para 27] DETAILED DESCRIPTION OF THE INVENTION

[Para 28] Although certain preferred embodiments of the present invention will be shown and described in detail, it should be understood that various changes and modifications may be made without departing from the scope of the appended claims.

[Para 29] FIG. 2 illustrates a dialog box which has been programmed in Visual Basic to serve as a facilitator between a Database and CAD software. An operator enters inputs into the dialog box such as tank diameter in the case of round tanks 1 or tank length 19 in the case of square or rectangular tanks, tank width in the case of square or rectangular tanks 20, freeboard 3 (height of tank above top water level), diffuser elevation 4 (over the tank floor), header pipe quantity 9, diffuser type 10, and desired diffuser density 5. The operator then clicks the draw button at the bottom of the dialog box, opens the CAD window, and clicks anywhere on the screen. The CAD program then automatically generates the two drawings and two tables.

[Para 30] The program considers the active surface area of each disc diffuser 16 or tube diffuser 18, in order to calculate the appropriate diffuser density on the tank floor. It then proceeds to draw the tank dimensions and optimize the required quantity of diffusers on the quantity of header pipes 9 selected by the operator. The method of calculation is particularly novel for round tanks (FIG. 3), where headers are of different lengths. Finally the drop pipe 14, manifold 12, support stands 15 and expansion joints 17 are placed at necessary locations. All pipes are shown as two line drawings to scale in accordance with the pipe sizes entered in the dialog box. Dimensions 11 are shown. The final result within a single CAD page appears with two drawings (plan and section as in FIG. 3 and FIG. 5) and two tables (inputs and take-off output as in FIG. 6 and FIG. 7).

**[Para 31]** One CAD system suitable for use in the present invention is AUTOCAD 2000 available from Autodesk, Inc. One Database system suitable for use in the present invention is SQL Server from Microsoft Corporation. A variety of computer-aided-drawing (CAD) software programs and database services are available commercially, and no novelty is considered to reside in the particular software programs or computers, printers, input stations and the like selected for the production of the drawings.

**[Para 32]** It should be understood that a single personal computer may be used to carry out the claimed method.